

THE HYDROGENATION OF CARBON MONOXIDE OVER UNSUPPORTED IRON-MANGANESE CATALYSTS FOR THE PRODUCTION OF LOW-MOLECULAR WEIGHT OLEFINS. Y. S. Tsai, A. G. Oblad and F. V. Hanson, Department of Fuels Engineering, 320 W. C. Browning Building, University of Utah, Salt Lake City, Utah 84112.

The hydrogenation of carbon monoxide for the production of low molecular weight ( $C_2$ - $C_4$ ) olefins has been investigated over unsupported iron-manganese catalysts. A series of fifteen catalysts of different iron/manganese ratio were prepared and evaluated.

The screening tests were conducted in a fixed-bed, bench-scale reactor. The standard catalyst evaluation conditions were 473-523 K, 500 psig, 2/1  $H_2/CO$  ratio and a gas hourly space velocity  $1.08 \text{ cm}^3 \text{ g}^{-1} \text{ s}^{-1}$ . The most promising catalyst with regard to the  $C_2$ - $C_4$  hydrocarbon yield was composed of 2.2 parts of manganese per 100 parts of iron.

Four of the catalysts,  $Mn/Fe=2.2$ ,  $Mn/Fe=8.4$ ,  $Mn/Fe=63$  and  $Mn/Fe=278$  were selected for an extended process variable investigation. The olefin yield increased with increasing reaction temperatures, with decreasing space velocity and with decreasing  $H_2/CO$  ratio. The dependence of the olefin yield on reactor pressure reported in the literature was not observed in this investigation. The activation energy in the temperature range 473-523 K was 20-30  $\text{kcal mol}^{-1}$ .